DOCUMENT RESUME

ED 405 033 JC 970 139

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TITLE Engaging Students in Large Lecture Classes.
PUB DATE Mar 96
NOTE 15p.; In: Proceedings of the Annual Conference on Undergraduate Teaching of Psychology (10th, Ellenville, NY, March 20-22, 1996); see JC 970 128.
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Classroom Techniques; Higher Education; *Instructional Effectiveness; Introductory Courses; Participant Satisfaction; *Psychology; *Questioning Techniques; *Student Attitudes; *Student Participation; Teaching Methods

ABSTRACT

In an effort to encourage student participation and instructor-student communication in a large introductory psychology course, an approach was developed to call on students involuntarily to answer critical thinking questions rather than factual questions. To address the possibility that students would be anxious and intimidated about speaking in a large class, the interaction was made more personal by addressing students by their first name, students were given adequate time to formulate answers, and students were allowed to refuse to answer questions. At the end of the semester, an evaluation questionnaire containing both closed- and open-ended questions was distributed to students, with 124 filling out questionnaires. Among the respondents, 90 included comments about their thoughts on students being called at random in a large lecture class and 60 indicated that they had participated involuntarily. Results of the closed-ended survey questions suggested that students preferred critical thinking questions to fact-based questions and that involuntary participation increased attentiveness and course preparation. However, findings also suggested that involuntary participation did not lead to subsequent voluntary participation. In sum, students' evaluations of the method were generally positive, while evidence was also found that the method supported course learning goals. Includes tables of survey results. Contains 12 references. (TGI)

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ED 405 033

Engaging Students in Large Lecture Classes

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Author Notes

Paper presented at the Tenth Annual Conference on Undergraduate Teaching of Psychology, Ellenville, NY. (March 20-22, 1996)

JC 970 139

Abstract

A method of involuntary participation (calling on students who do not have their hands raised to answer questions) was developed which incorporated critical thinking questions and a non-intimidating questioning style. This method was employed in a large introduction to psychology course (over 100 students). An evaluation survey with both closed- and open-ended questions was distributed to students. Results of the closed-ended survey questions suggested that students prefer critical thinking questions to fact-based ones, that involuntary participation increased attentiveness and course preparation, but that involuntary participation did not lead to subsequent voluntary participation (raising one's hand to ask a question). Students' written evaluations supported these results, identified positive and negative effects of the method, and made suggestions for implementation this method in large lecture classes. Alternatives to this approach are discussed.

Engaging Students in Large Lecture Classes

Universities seem to have a love-hate relationship with large lecture courses (100-250 students). Due to the economic conditions of many institutions, offering a few large sections of a course with 100 or more students is an attractive alternative to offering many small sections (Gleason, 1986; Jenkins, 1991). However, as Jenkins (1991) explains, "Most psychologists with whom I have talked believe deep down that there is something wrong with large classes; at best, they are ineffective; at worst, large classes are somehow immoral." (p. 75)

Problems with Large Lecture Classes

One reason large courses are considered ineffective is that they inhibit both instructor-student, and student-student communication (Gleason, 1986). This is a major concern because dynamic communication among instructors and students is thought to facilitate the learning process (Christensen, 1989).

One way to encourage communication in large courses is to call on students who raise their hands to answer questions (voluntary participation). Although there are benefits to this approach (e.g., greater student-teacher interaction), there are also several problems with it. First, students are sometimes reluctant to raise their hands to answer questions. Consequently, many instructors supply answers to avoid long, silent pauses. Second, a strict response pattern is established early on--some students contribute often and are reinforced for sharing their ideas while others remain taciturn and are reinforced for not sharing their ideas (McDougall & Cordeiro, 1993). A third problem arises when instructors use voluntary participation to learn students' names. If only a minority of students participate, then the instructor can learn only a few names.

Involuntary Participation

An alternative way to ensure that more than just a few students speak in class, and that a strict response pattern does not form, is to call on students who do not have their hands raised, defined as involuntary participation or calling on students "at random" (e.g.,

without repetition). By increasing the number of students who speak in class, an instructor may increase the number of students' names learned as well. Involuntary participation has been said to encourage class preparation, to increase confidence in responding, and to have a positive affect on learning (Christensen, 1989; Mastropieri & Scruggs, 1987; McDougall & Cordeiro, 1992; 1993).

Despite these potential benefits, some instructors may not want to call on students at random because of a fear that students' comments would decrease the class' attentiveness (Gleason, 1986). Students may also become anxious about being called on at random if the purpose of questioning is to test factual knowledge of assigned readings--a kind of "oral pop quiz" (e.g., McDougall & Cordeiro, 1992; 1993).

We developed a method of involuntary participation as an alternative to McDougall and Cordeiro's (1992; 1993) method and assessed whether this method had an effect on students' in-class behavior. In our method, students were called on involuntarily to answer critical thinking questions (those that require opinions and explanations of experimental results or solutions to real-world issues in psychology) rather than to answer factual questions as McDougall and Cordeiro (1992; 1993) endorse. The development of the questions was informed by the Immersion Approach to Psychological Instruction described by Gray (1993) who argues that instructors should develop lectures and discussion questions that allow students to think critically about science. To address the possibility that students would be anxious about speaking in a large class, we tried to make the interaction more personal (and hopefully less intimidating) by addressing students by their first name, by giving students adequate time to formulate their answers, and by allowing students to refuse to answer questions.

We surveyed students' opinions about the use of critical thinking questions. Additionally, based on Gleason (1986), we investigated whether or not students believed that involuntary participation led them to be more attentive in class or to prepare more for class because these behaviors could have a positive impact on learning. For those students

who had been called on at random, we assessed whether this experience served as an "ice breaker" leading to subsequent voluntarily participation because such behavior could have an indirect effect on learning by increasing students' involvement in the material covered in class. We also gave students an opportunity to evaluate the technique overall.

Questioning Technique

Students were asked critical thinking questions at the beginning of each lecture. For example, at the beginning of an introductory lecture on mind-brain relationships, a neuropsychological case study was described and a student was asked at random, "(Name of student), this case study shows that damage to the mind-brain can impair some abilities while leaving others intact. What does this finding tell us about how the brain may be organized?" After the student responds, a new student is selected to follow-up on his or her peer's comment. In this case, the students' answers were used as a basis for explaining the Modularity of Mind Hypothesis (Fodor, 1983). Such questioning lasted approximately 5 - 7 minutes. (Although we did not evaluate this claim explicitly, it was thought that asking questions at the beginning of lecture would increase students' intrinsic interest in the subject matter because they would want to find out whether their ideas were supported by research findings covered in lecture as suggested by Frederick (1986)).

Queries were never prefaced by the cue "What would you say if you saw this question on a test?" as suggested by (Gleason, 1986) because this cue may communicate to students that they should learn the material to do well on exams rather than learn the material because it is inherently interesting and applicable to their lives (Conti, Amabile, & Pollak (in press); Lepper & Green, 1978; Tuckman, 1991).

With regard to questioning style, students were given adequate time to formulate an answer to a question and were allowed to refuse to answer a question. If a student's answer was roundabout or spoken softly, his or her answer was carefully reworded or amplified.

Over the course of the semester, the instructor (GM) called on students at random 1-5 times per class (M=3.0). This was accomplished by reading names from a course list without repetition.

Evaluation

Respondents

One hundred and twenty-four, first-year and sophomore students (74 females, 50 males) in an introduction to psychology course voluntarily filled out a survey as part of an end-of-semester course evaluation. Of these, sixty students (31 females, 29 males) indicated that they participated involuntarily.

Method

Surveys were distributed in small (30 student) discussion sections. Although discussion leaders passed out the surveys, they were not present when students filled it out. A student volunteer collected the completed surveys.

Survey

A three-item evaluation survey was developed. For each item, students circled "agree", "disagree", or "not sure/don't know". To evaluate the use of critical thinking questions, students were asked, "I would prefer instructors to call on students at random in large classes to answer critical thinking questions rather than fact-based ones." To assess whether students believed this technique had an effect on in-class behavior, students were asked, "Knowing I could be called on at random to answer a question made me pay more attention in class or made me prepare more for class." Students who had been called on involuntarily were asked, "Being called on at random made me participate voluntarily more at other times."

To allow students to elaborate on their thoughts about involuntary participation in large lecture classes they were asked, "Elaborate on your thoughts about calling on students at random in large lecture classes." We hoped that this question would offer students an

opportunity to comment on our style of questioning as well. Of our 124 respondents, 90 filled out this closed-ended question.

Results and Discussion[1]

Significantly more students agreed overall that they preferred instructors to call on students at random to answer critical thinking questions rather than fact-based questions ($\chi^2(2, N=124) = 21.5$, $p < .05$, for the overall chi square; $\chi^2(1, N=90) = 17.8$, $p<.05$ for agree vs. disagree). See Table 1. This finding is also supported by students' open-ended comments as can be seen in Table 2. Although this result is consistent with our expectations, one should observe caution in interpreting this result because it is not clear whether it reflects a true preference, or reflects the fact that students were exposed to critical thinking questions solely.

Insert Table 1 about here

Insert Table 2 about here

Consistent with other claims (McDougall & Cordeiro, 1993), significantly more students agreed that knowing they could be called on at random made them pay attention or prepare more for class than disagreed ($\chi^2(2, N=124) = 7.0$, $p < .05$, for the overall chi square; $\chi^2(1, N=91) = 4.0$, $p<.05$ for the comparison between agree vs. disagree). This finding was echoed in students written comments. Thus, we conclude that students believed that this method had some effect on their behavior that could benefit learning.

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[1]Although we did not anticipate sex differences in responses to open-ended questions, we investigated this possibility in our statistical analyses. No sex differences emerged, hence, these results are not reported.

This finding is in contrast with Gleason (1986) who notes that students' comments can decrease class attentiveness.

Students who had been called on at random did not overall agree that this experience increased the likelihood that they would participate voluntarily at other times, $\chi^2(2, N=57) = 3.3$, n.s. Thus, we cannot conclude that being called on at random served as an "ice breaker" leading to subsequent voluntary participation. One possible explanation for this result is that students did not remember whether their experience had an effect on their voluntary participation. This would be particularly true for students who had been called on at the beginning on the semester. An alternative explanation is that students did not have enough opportunities to answer questions involuntarily to have made an impact on their voluntary participation. This second possibility predicts that a relationship between involuntary participation and voluntary participation would emerge in a smaller course because students could be called on more often over the semester. Such a relationship is suggested by Christensen (1989).

Students' written comments about calling on students at random in large lecture courses were analyzed by categorizing their responses into several categories. The first category, global evaluation (54% of comments) shows that 44% of students' general comments were generally positive, while 10% were generally negative.

The second category, positive effects of the approach (59% of comments), showed that, in contrast with Gleason (1986), 22% of students felt that the method kept their attention or interest in the material and 7% mentioned that they enjoyed the discussion generated from the students. Additionally, in line with Gleason's (1986) suggestion that communication in large lecture classes is facilitated when instructors try to make students feel that the space is smaller than it actually is, several students noted that this method made the course "feel small" and that they felt like an individual. Other comments in this category supported learning goals (e.g., provides a productive, relaxed and friendly atmosphere).

While many students had positive comments, some were negative (16%). Consistent with Gleason (1986) some students felt nervous or self-conscious about speaking or felt that the procedure slowed the learning process.

The final category, suggestions for implementation (25% of comments), captured some aspects of our method that students liked such as the fact that we addressed students' by name. Other comments highlighted the need for sensitivity when using this approach (Don't call on unmotivated students exclusively; some students may be bashful about speaking because they have accents) .

In sum, students evaluations were generally positive, although some students identified potential concerns with the method. Additionally, we found some evidence that this method may support learning goals. Given that the trend to enroll large lecture courses will not cease in the near future, we agree with Gleason (1986) that it is an instructor's responsibility to make these classes quality learning environments. Calling on students involuntarily may be one way to work toward this goal.

Should this Method be Used in Every Large Class?

Although our evaluation data suggest that there are some benefits to calling on students at random in large classes, this technique may not be appropriate for all cases. An instructor's decision whether or not to use it must take into account their willingness to field the broad range of questions and comments that can be engendered from this approach.

For those instructors who feel uncomfortable with their ability to mediate students' comments or believe that calling on students at random takes away students' right to choose whether or not to participate, we recommend a "pseudo-random" questioning technique (as described in Gleason, 1986). In this approach, specific students are chosen at random and instructed to participate in the following lecture. Students who know in advance that they will be called on are thought to prepare more for the class. The benefit of this approach is that instructors are less likely to catch students off guard. A potential drawback to this

approach is that only a small number of students (those who know they will be called on) may prepare for class.

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Table 1

Summary of Results to Closed-Ended Evaluation Survey Questions

Item	Frequency (%)			
	Agree	Disagree	Not sure/ Don't know	χ^2
I would prefer instructors to call on students at random in large classes to answer critical thinking questions rather than fact-based ones	65(52)	25(20)	34(27)	$p<.05$
Knowing that I could be called on at random to answer a question made me pay more attention in class; made me prepare more for class	55(44)	36(29)	33(27)	$p<.05$
Being called on at random made me participate voluntarily more at other times	23(38)	19(32)	18(30)	n.s.

Note. Percents have been rounded off to the nearest whole number.

Table 2

Categories of Students' Comments About the Use of Involuntary Participation in Large Lecture Classes

Response Category	% Responding
Global Evaluation	
Good idea; positive experience	44
I did not want to be called on at random; only those who have their hands raised should be called on to answer questions	10
Positive Effects of Calling on Students at Random	
Kept my attention; interest in subject matter	22
Makes students prepare for class	10
Makes the class feel small; I feel like an individual	8
Provides productive, relaxed, friendly atmosphere	7
Enjoyed discussion generated from student comments	7
Shows that Professor cares about students; takes students seriously	5
Negative Effects of Calling on Students at Random	
Made me nervous or self-conscious	12
Takes too much time; slows learning process	4
Suggestions for Implementation in Class	
Ask critical thinking; opinion questions only	10
Professors should not force students to answer questions	5
It is best if the professor asks for student names and tries to remember them	3
Calling on students at random should be done in moderation	2
Ask fact questions only	2
Don't call on unmotivated students exclusively	1
Note that some people have accents and may be bashful about speaking	1
Make certain the talker speaks loudly or rephrase the answer to class	1

Note. Number of respondents = 90. Any one response could be coded into one or more categories. Percents have been rounded off to the nearest whole number.